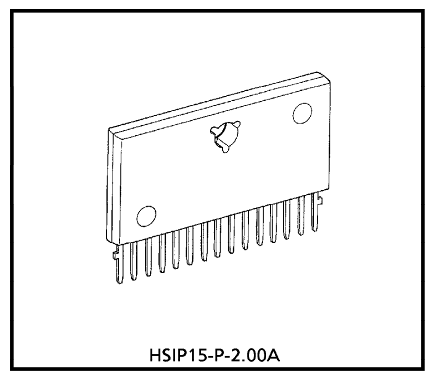
TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT

TA8229K

SILICON MONOLITHIC

LOW FREQUENCY POWER AMPLIFIER

TA8229K is an audio power IC with built-in two channels developed for portable radio cassette tape recorder with power ON / OFF switch.
Because of the parts reduction and SIP (Single Inline Package), space merit is remarkable.
Thermal shut down protection circuit is built in.



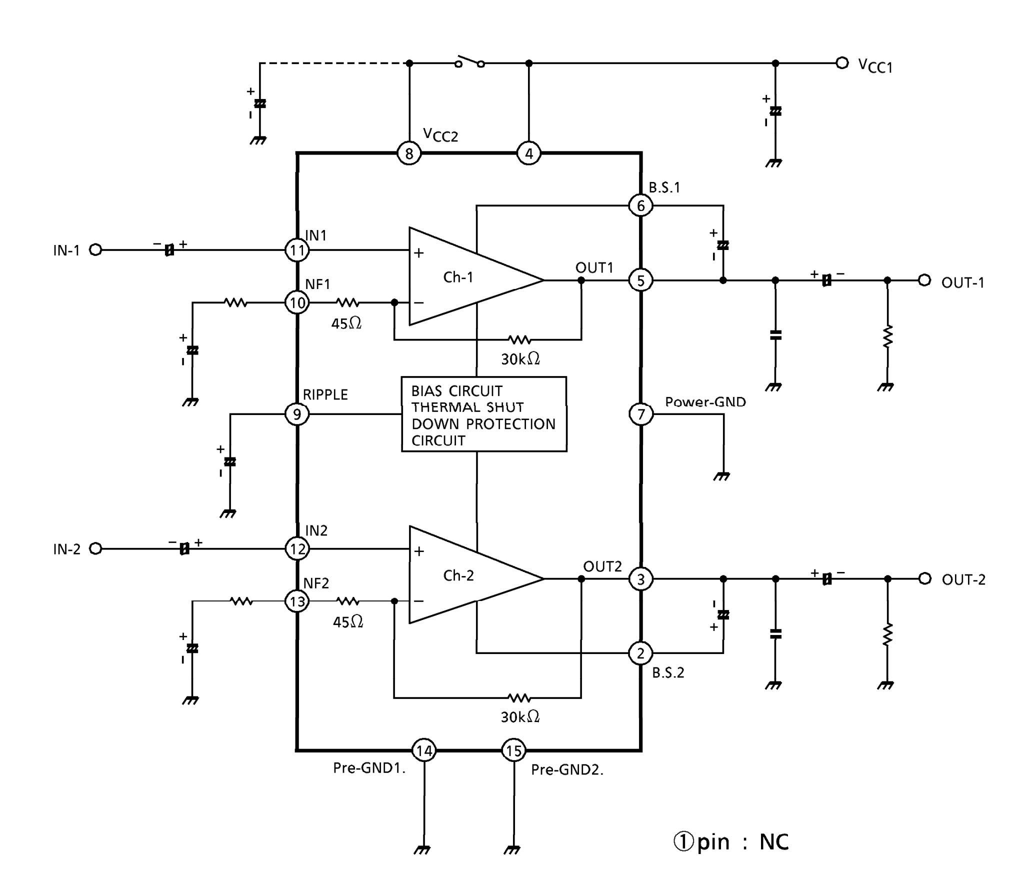
HSIP15-P-2.00A

Weight : 3.9g (Typ.)

FEATURES

- High Power
  - : $P_{out\,(1)} = 2.5W$ (Typ.)
    ($V_{CC} = 9V$, $R_L = 4\Omega$, f = 1kHz, THD = 10%)
  - : $P_{out\,(2)} = 4.6W$ (Typ.)
    ($V_{CC} = 12V$, $R_L = 4\Omega$, f = 1kHz, THD = 10%)
- Low Popping Noise at Power ON
- Small Quiescent Current
  - : $I_{CCQ} = 21mA$ (Typ.) ($V_{CC} = 15V$, $V_{in} = 0$)
- Soft Clip
- Built-in Thermal Shut Down Protection Circuit
- Best for Supply Voltage 9V, 12V
- Operation Supply Voltage Range : $V_{CC\,(opr)} = 6 \sim 15V$ (Ta = 25°C)

BLOCK DIAGRAM



APPLICATION INFORMATION AND APPLICATION METHOD

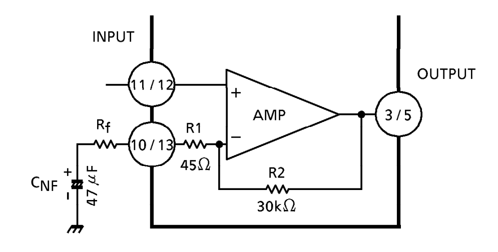
1. Adjustment of voltage gain

   The voltage gain G_V is obtained as follows by R1, R2 and R_f in Fig.1.

   $$G_V = 20\ell og \frac{R_f + R1 + R2}{R_f + R1}$$

   When $R_f = 0\Omega$, $G_V = 56.5\text{dB}$ (Typ.)
   When $R_f = 120\Omega$, $G_V = 45\text{dB}$ (Typ.)

   By increasing R_f, reduction of G_V is possible.
   However, since the feedback increase is liable to produce oscillation, it is recommended to use this at 40dB or over.



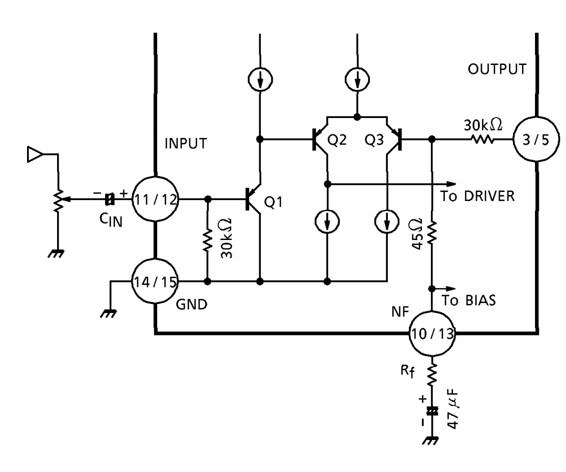
〔Fig.1〕

2. Thermal shut-down circuit

   The thermal shut-down circuit is built in for the purpose of preventing the destruction of IC due to the abnormal temperature rise when the heat radiation is insufficient.
   The operation temperature is set at radiation Fin temperature 175°C (Typ.). At this temperature or over the bias is interrupted to prevent the destruction of IC.

3. Input stage

   The input circuit of this IC is as shown in Fig.2.
   PNP Tr : Q1 is provided in the input circuit so as to make its usage possible without the input coupling capacitor.
   However, at pin⑪ and ⑫, max 60mV offset voltage is produced.
   Application after checking volume slide noise is recommended.
   For cutting the volume slide noise, insert the input capacitor : C_{IN} in series to interrupt the DC component.



〔Fig.2〕

4. Oscillation preventive measures

   For oscillation preventive capacitor C6 and C7 between the output terminal and GND, it is recommended to use polyester film capacitor having good characteristics for temperature and for high frequency.
   Since the characteristics of the capacitor is liable to be influenced by the temperature, use this capacitor after the temperature test to check the oscillation allowance.
   In addition, as the position of the electrolytic capacitor has a remarkable influence on the oscillation, connect C10 to V_{CC} at the nearest possible position from power GND.
   At using this application with the voltage gain reduced, oscillation is liable to be produced. Apply the capacitor after checking enough for its capacity, type and mounting position.

   (*) As the oscillation allowance varies according to the printed pattern layout, the standard printed board of TOSHIBA is recommended to be referred to design it.

5. Power ON / OFF switch

   There is power ON / OFF switch at ⑧pin. However, output power is changed by ⑧pin supply voltage when ⑧pin supply voltage is not same ④pin supply voltage, after referring to attached date, select ⑧pin supply voltage.

6. Input voltage

   When the excessive signal is input, turning-up is produced in the clip waveform.
   The turning-up point is $V_{in} = 300mV_{rms}$ (Typ.) : $V_{CC} = 9V$, $R_L = 4\Omega$, f = 1kHz : Enough care must be taken for this phenomenon.

MAXIMUM RATINGS (Ta = 25°C)

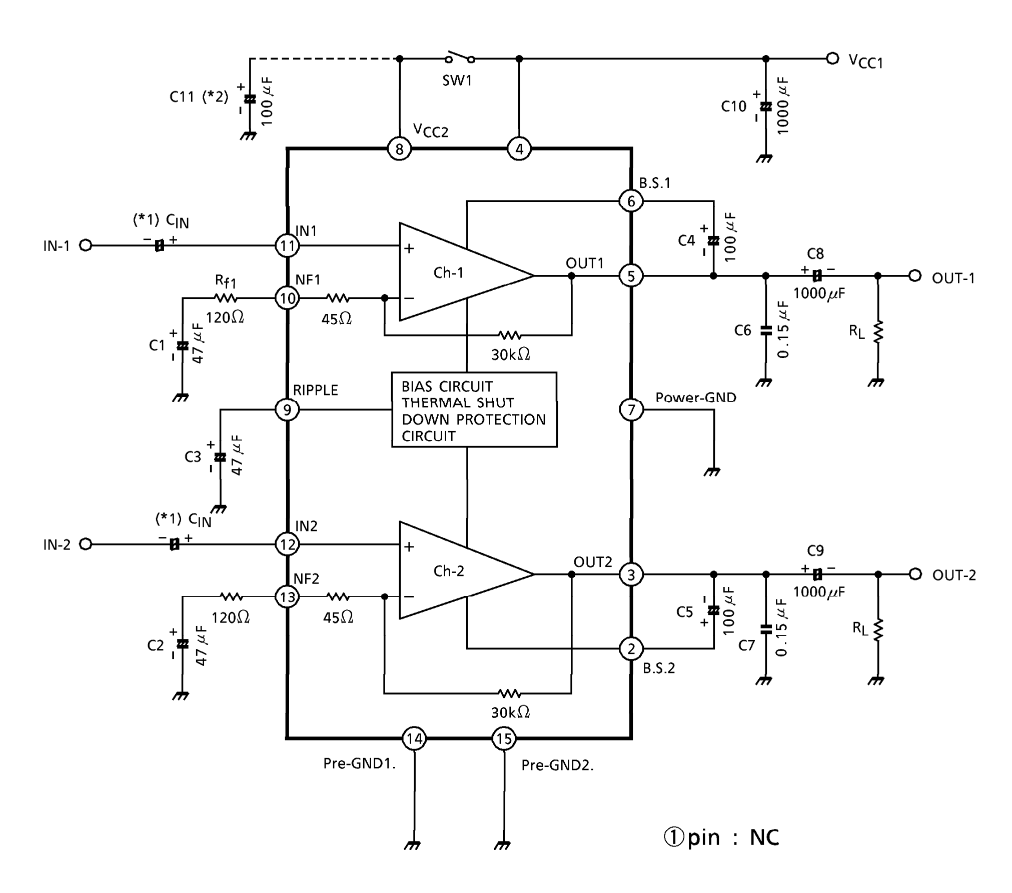
CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	V_{CC}	20	V
Output Current (Peak / CH)	$I_{O\,(peak)}$	2.5	A
Power Dissipation	P_D (Note)	15.0	W
Operating Temperature	T_{opr}	−20~75	°C
Storage Temperature	T_{stg}	−55~150	°C

(Note) Derated above Ta = 25°C in the proportion of 120mW / °C.

ELECTRICAL CHARACTERISTICS
(Unless otherwise specified, $V_{CC}=9V$, $R_L=4\Omega$, $R_g=600\Omega$, f = 1kHz, Ta = 25°C, $R_f=120\Omega$)

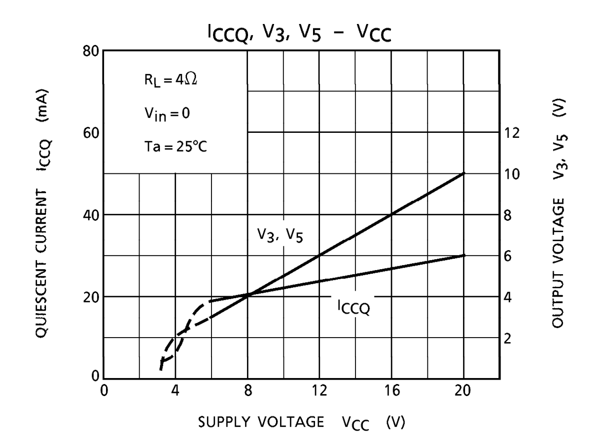
CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Quiescent Current	I_{CCQ}	—	$V_{in}=0$	—	21	45	mA
Output Power	$P_{out\,(1)}$	—	THD = 10%	2.0	2.5	—	W
	$P_{out\,(2)}$	—	THD = 10%, $V_{CC}=12V$	—	4.6	—	
Total Harmonic Distortion	THD	—	$P_{out}=0.4W$ / ch	—	0.2	1.0	%
Voltage Gain	$G_V\,(1)$	—	$R_f=120\Omega$, $V_{out}=0.775V_{rms}$ (0dBm)	43	45	47	dB
	$G_V\,(2)$	—	$R_f=0$, $V_{out}=0.775V_{rms}$ (0dBm)	—	56.5	—	
Input Resistance	R_{IN}	—		—	30	—	kΩ
Output Noise Voltage	V_{no}	—	$R_g=10k\Omega$, BW = 20Hz~20kHz	—	0.3	1.0	mV_{rms}
Ripple Rejection Ratio	R.R.	—	$R_g=600\Omega$, $f_{ripple}=100kHz$	—	–52	—	dB
Cross Talk	C.T.	—	$R_g=600\Omega$, amp1↔2 $V_{out}=0.775V_{rms}$ (0dBm)	—	–50	—	dB
Input Offset Voltage	V_{11}, V_{12}	—	—	—	30	60	mV
Stand-by Current	I_{OFF}	—	SW1→OFF	—	1	—	μA

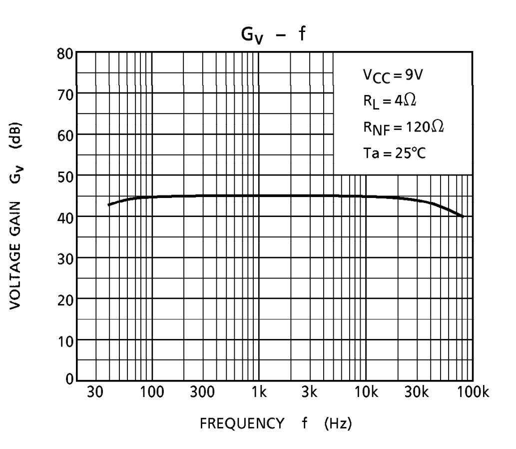
TEST CIRCUIT

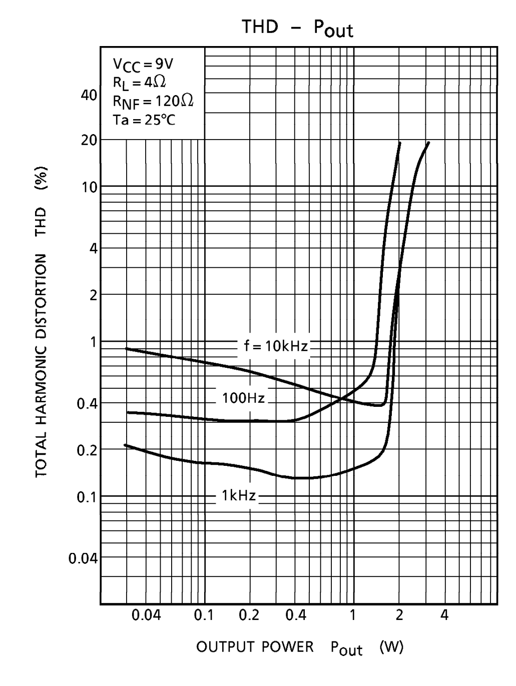


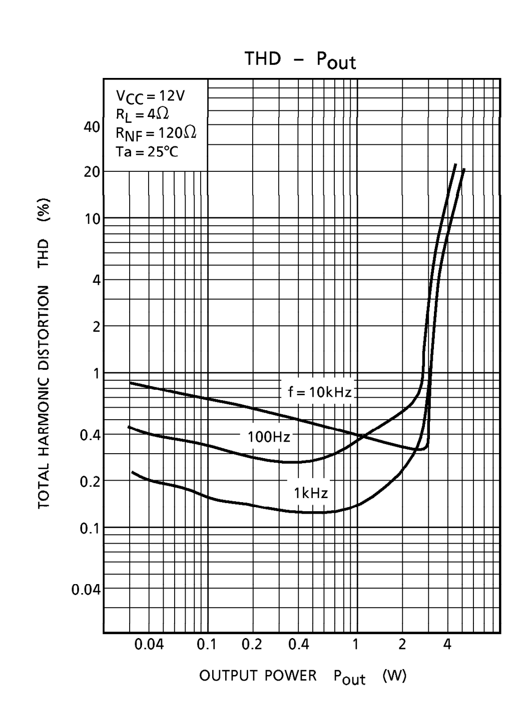
(*1) This IC can be used without coupling capacitor (C_{IN}).
If volume slide noise occurred by input offset voltage is undesirable, it needs to use the capacitor (C_{IN}).

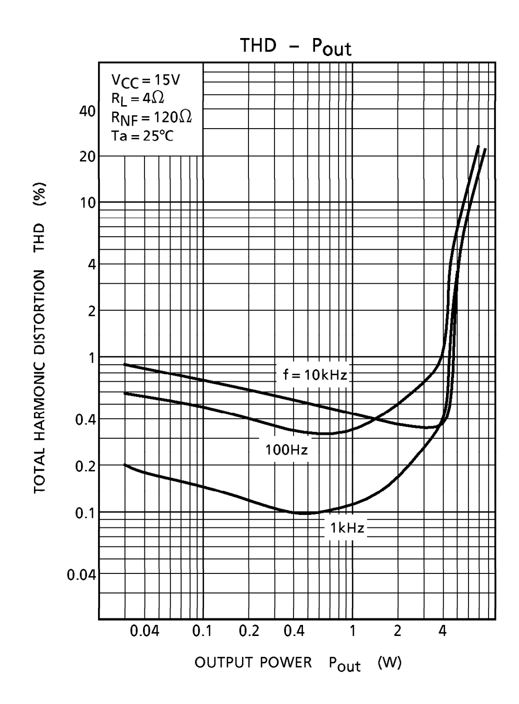
(*2) The condenser between the ⑧pin and the GND (C11) is for reducing POP noise when the power ON / OFF switch (SW1) is set to ON / OFF.

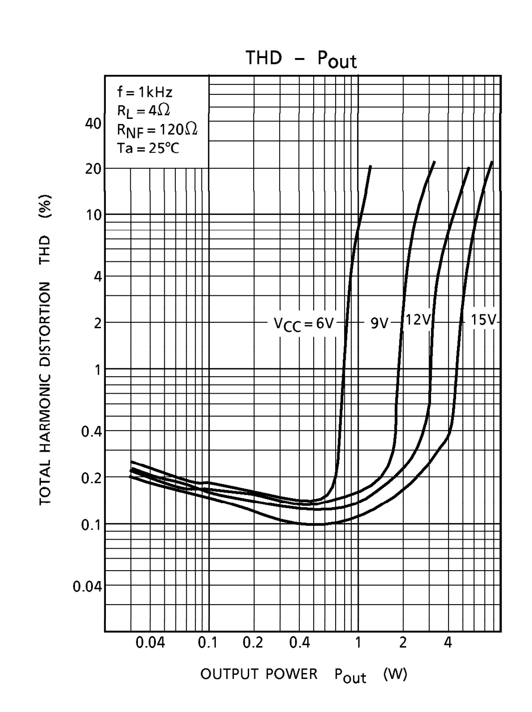

ICCQ, V3, V5 – VCC
RL = 4Ω
Vin = 0
Ta = 25°C
V3, V5
ICCQ
QUIESCENT CURRENT ICCQ (mA)
OUTPUT VOLTAGE V3, V5 (V)
SUPPLY VOLTAGE VCC (V)
0
4
8
12
16
20
20
40
60
80
2
6
10

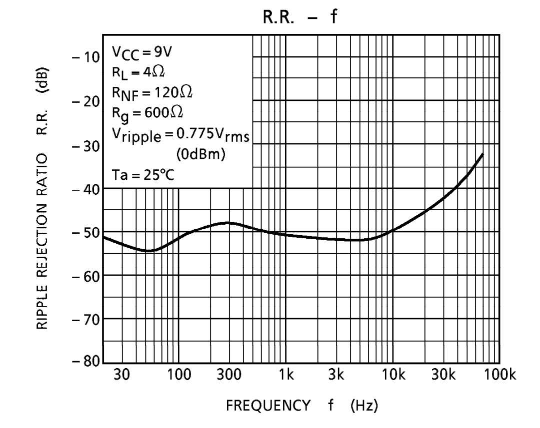

GV – f
VCC = 9V
RL = 4Ω
RNF = 120Ω
Ta = 25°C
VOLTAGE GAIN GV (dB)
FREQUENCY f (Hz)
30
100
300
1k
3k
10k
30k
100k
0
10
20
30
40
50
60
70
80

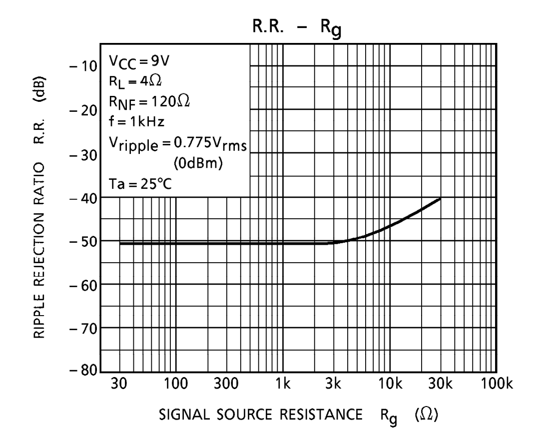

THD – Pout
VCC = 9V
RL = 4Ω
RNF = 120Ω
Ta = 25°C
f = 10kHz
100Hz
1kHz
TOTAL HARMONIC DISTORTION THD (%)
OUTPUT POWER Pout (W)
0.04
0.1
0.2
0.4
1
2
4
10
20
40

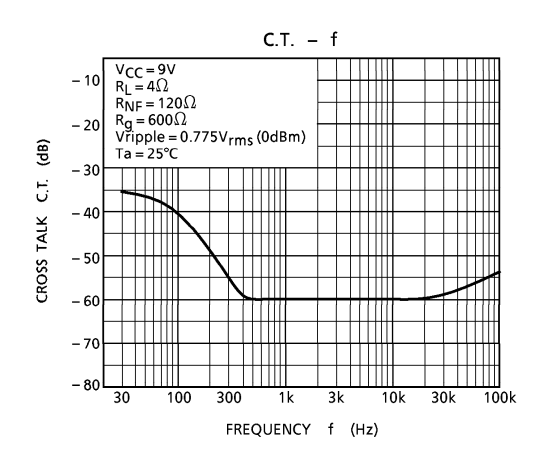

THD – Pout
VCC = 12V
RL = 4Ω
RNF = 120Ω
Ta = 25°C
f = 10kHz
100Hz
1kHz
TOTAL HARMONIC DISTORTION THD (%)
OUTPUT POWER Pout (W)
0.04
0.1
0.2
0.4
1
2
4
10
20
40

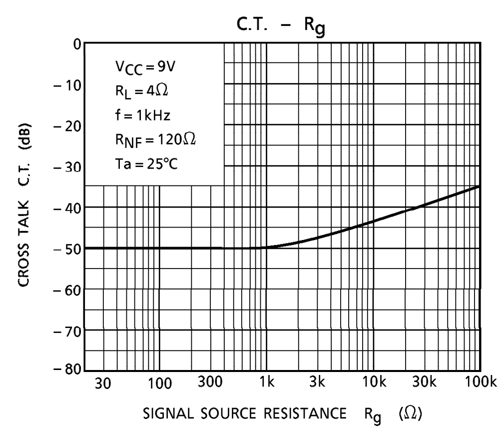

THD – Pout
VCC = 15V
RL = 4Ω
RNF = 120Ω
Ta = 25°C
f = 10kHz
100Hz
1kHz
TOTAL HARMONIC DISTORTION THD (%)
40
20
10
4
2
1
0.4
0.2
0.1
0.04
0.04
0.1
0.2
0.4
1
2
4
OUTPUT POWER Pout (W)

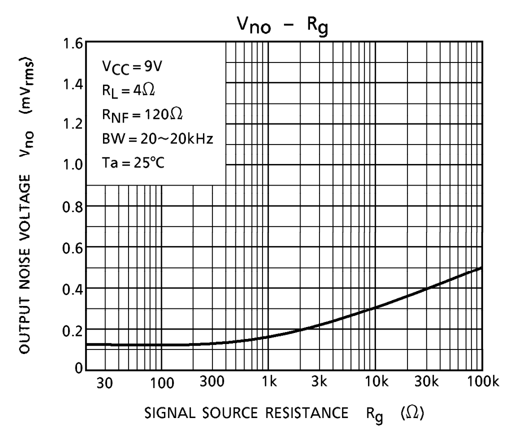

THD – Pout
f = 1kHz
RL = 4Ω
RNF = 120Ω
Ta = 25°C
VCC = 6V
9V
12V
15V
TOTAL HARMONIC DISTORTION THD (%)
40
20
10
4
2
1
0.4
0.2
0.1
0.04
0.04
0.1
0.2
0.4
1
2
4
OUTPUT POWER Pout (W)

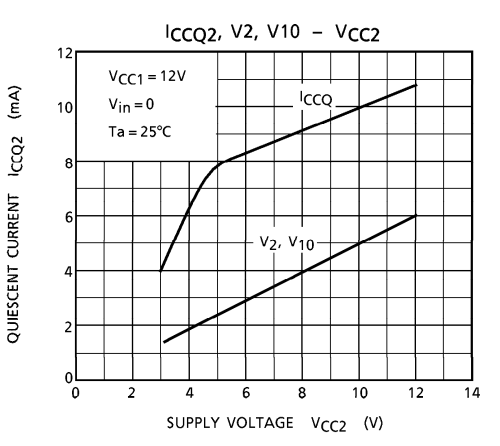

R.R. – f
VCC = 9V
RL = 4Ω
RNF = 120Ω
Rg = 600Ω
Vripple = 0.775Vrms
(0dBm)
Ta = 25°C
RIPPLE REJECTION RATIO R.R. (dB)
−10
−20
−30
−40
−50
−60
−70
−80
30
100
300
1k
3k
10k
30k
100k
FREQUENCY f (Hz)

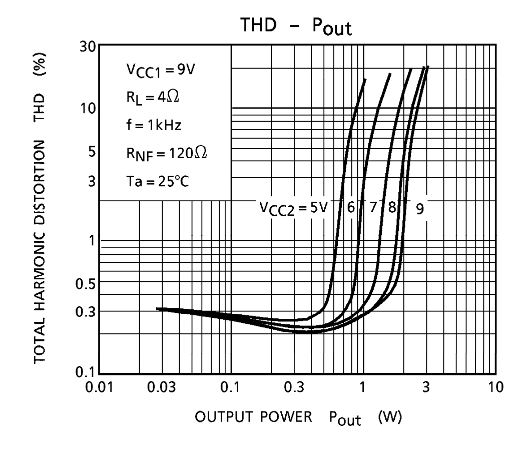

R.R. – Rg
VCC = 9V
RL = 4Ω
RNF = 120Ω
f = 1kHz
Vripple = 0.775Vrms
(0dBm)
Ta = 25°C
RIPPLE REJECTION RATIO R.R. (dB)
−10
−20
−30
−40
−50
−60
−70
−80
30
100
300
1k
3k
10k
30k
100k
SIGNAL SOURCE RESISTANCE Rg (Ω)

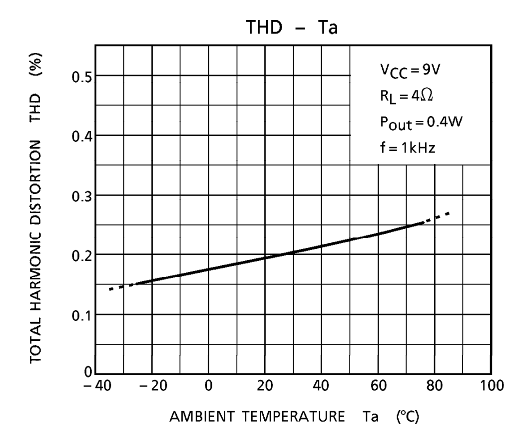

C.T. – f
VCC = 9V
RL = 4Ω
RNF = 120Ω
Rg = 600Ω
Vripple = 0.775Vrms (0dBm)
Ta = 25°C
CROSS TALK C.T. (dB)
FREQUENCY f (Hz)

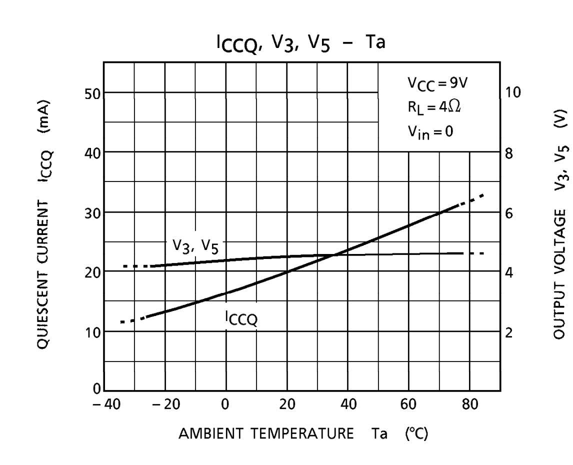

C.T. – Rg
VCC = 9V
RL = 4Ω
f = 1kHz
RNF = 120Ω
Ta = 25°C
CROSS TALK C.T. (dB)
SIGNAL SOURCE RESISTANCE Rg (Ω)

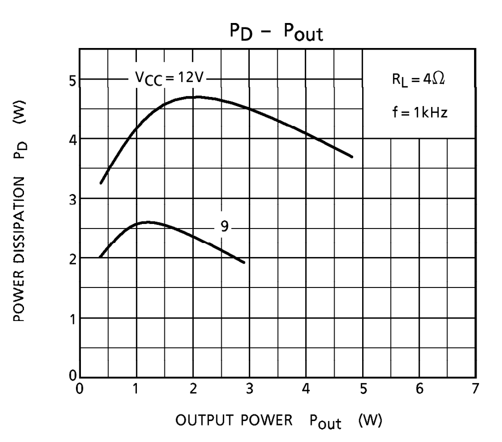

Vno – Rg
VCC = 9V
RL = 4Ω
RNF = 120Ω
BW = 20~20kHz
Ta = 25°C
OUTPUT NOISE VOLTAGE Vno (mVrms)
SIGNAL SOURCE RESISTANCE Rg (Ω)

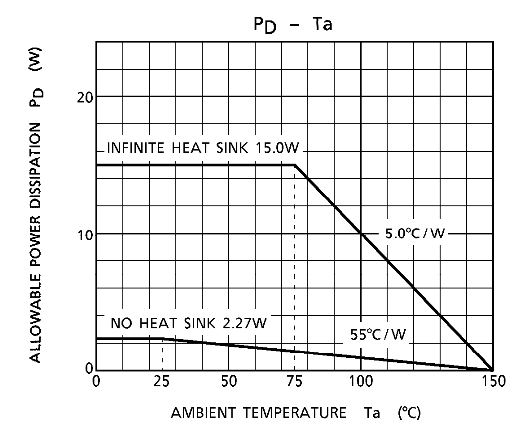

ICCQ2, V2, V10 – VCC2
VCC1 = 12V
Vin = 0
Ta = 25°C
ICCQ
V2, V10
QUIESCENT CURRENT ICCQ2 (mA)
OUTPUT VOLTAGE V2, V10 (V)
SUPPLY VOLTAGE VCC2 (V)


THD – Pout
VCC1 = 9V
RL = 4Ω
f = 1kHz
RNF = 120Ω
Ta = 25°C
VCC2 = 5V
6
7
8
9
TOTAL HARMONIC DISTORTION THD (%)
OUTPUT POWER Pout (W)


THD – Ta
VCC = 9V
RL = 4Ω
Pout = 0.4W
f = 1kHz
TOTAL HARMONIC DISTORTION THD (%)
AMBIENT TEMPERATURE Ta (°C)

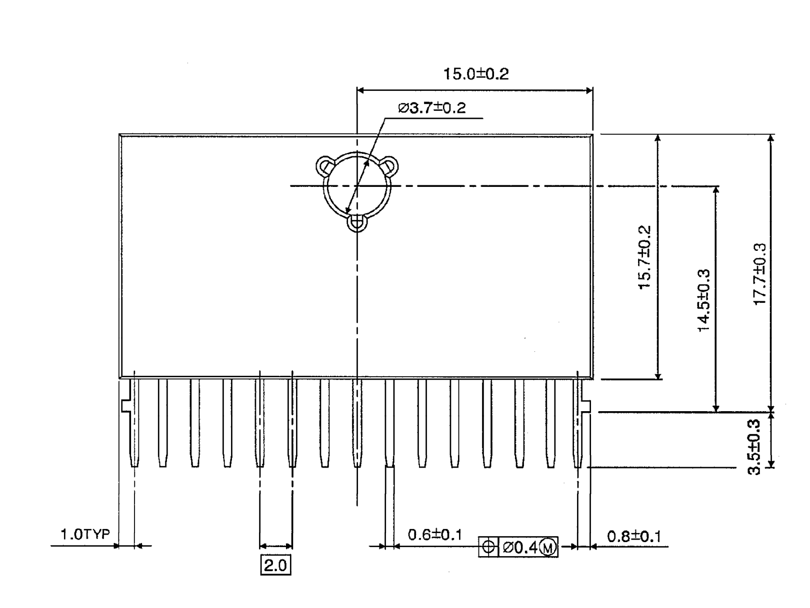

ICCQ, V3, V5 – Ta
VCC = 9V
RL = 4Ω
Vin = 0
V3, V5
ICCQ
QUIESCENT CURRENT ICCQ (mA)
OUTPUT VOLTAGE V3, V5 (V)
AMBIENT TEMPERATURE Ta (°C)
0
10
20
30
40
50
2
4
6
8
10
– 40
– 20
0
20
40
60
80

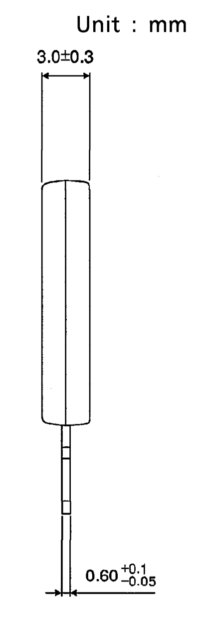

PD – Pout
VCC = 12V
9
RL = 4Ω
f = 1kHz
POWER DISSIPATION PD (W)
OUTPUT POWER Pout (W)
0
1
2
3
4
5
6
7

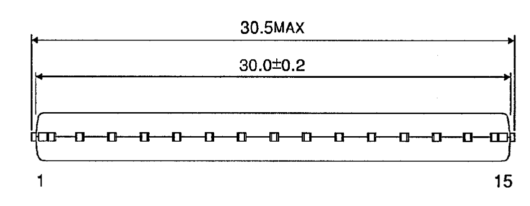

PD – Ta
INFINITE HEAT SINK 15.0W
5.0°C / W
NO HEAT SINK 2.27W
55°C / W
ALLOWABLE POWER DISSIPATION PD (W)
AMBIENT TEMPERATURE Ta (°C)
0
10
20
25
50
75
100
150

OUTLINE DRAWING
HSIP15-P-2.00A

Unit : mm







Weight : 3.9g (Typ.)